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(दूसरा पुनरीक्षण)

Indian Standard

STEEL TUBES FOR BICYCLE AND CYCLE RICKSHAWS — SPECIFICATION

(Second Revision)

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NEW DELHI 110002

June 1991

Price Group 3

Steel Tubes, Pipes and Fittings Sectional Committee, MTD 19

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Steel Tubes, Pipes and Fittings Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This Indian Standard was first published in 1964 and revised in 1981. The present revision covers requirements for electric resistance welded/induction welded tubes and cold finished electric resistance welded/induction welded tubes for the cycle and cycle rickshaw industries. Since seamless tubes are not used in the above industries, this specification does not cover the seamless tubes.

While preparing revision of this standard, vast data collected from different cycle industries and precision tube manufacturers has been taken into consideration.

To facilitate additions and alterations to the standard and to provide convenience to the users of the standard, this revision is being published in three separate parts but in the one volume as given below:

Part 1	General requirements
Part 2	Specific requirements for electric resistance welded and induction welded steel tubes
Part 3	Specific requirements for cold finished electric resistance welded and induction welded steel tubes

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
STEEL TUBES FOR BICYCLE AND CYCLE RICKSHAWS — SPECIFICATION

PART 1 GENERAL REQUIREMENTS

(Second Revision)

1 SCOPE

1.1 This Indian Standard provides for steel tubes for cycle and cycle rickshaw purposes in sizes up to and including 44·5 mm in outside diameter and covers the following types of tubes:

Type of Steel Tubes	*Tube Designation*	*Reference*
Electric resistance welded and induction welded tubes	ERW	Part II
Cold finished electric resistance welded and induction welded tubes	CEW	Part III

2 REFERENCES

2.1 The following Indian standards are necessary adjuncts to this standard:

IS No.	*Title*
1387 : 1967	General requirements for the supply of metallurgical materials (*first revision*)
1894 : 1972	Method for tensile testing of steel tubes (*first revision*)
2328 : 1985	Method for flattening test on metallic tubes (*first revision*)
2335 : 1985	Method for drift expanding test on metallic tubes (*first revision*)

3 MATERIAL

3.1 The general requirements relating to the supply of the material shall be as laid down in IS 1387 : 1967.

4 MANUFACTURE

4.1 The steel used for the manufacture of tubes shall be killed, semikilled or rimming quality. The tubes shall be manufactured by electric resistance or high frequency induction welded process, followed by subsequent cold working if required.

4.2 Condition of Supply

The tubes may be supplied in either as welded or annealed/normalized condition.

5 CHEMICAL COMPOSITION

5.1 The chemical composition of steel shall be as given in Table 1. The analysis of steel shall be carried out either by the method specifies in IS 228 and its relevant parts or by other established instrumental/chemical method. In case of dispute the procedure given in IS 228 and its relevant parts shall be the referee method. However, where the method is not given in IS 228 and its relevant parts, the refree method shall be as agreed between the purchaser and the manufacturer.

Table 1 Chemical Composition

Tube Designation	C Percent	Si Percent	Mn Percent	P Percent	S Percent
	Max	*Max*	*Max*	*Max*	*Max*
ERW C1	0·15	0·15	0·60	0·06	0·06
ERW C2	0·20	0·15	0·90	0·05	0·05
*ERW C3	0·25	0·35	1·20	0·05	0·05

*Macro alloy may be present.

6 WORKMANSHIP

6.1 The tubes shall have a workman like finish consistent with their method of manufacture and condition of supply. Small imperfections are permissible and it is permissible for these to be dressed out provided that the tubes thickness after dressing remains with in the tolerance limit. Peening of surface defects is not permitted.

6.2 Fin Height

The external weld upset shall be removed completely i.e. flush with the outside surface of the tube. The internal fin height shall not exceed 60 percent of wall thickness. If a reduction in the internal fin height is required it shall be a subject of agreement between the manufacturer and the purchaser.

6.3 Straightness

Unless otherwise agreed to between the purchaser and the manufacturer, tubes shall not be out of straightness by more than 1/600 th of any cut length up to one metre. Tubes in longer length shall not depart from straightness by more than 1 in 250 of any length measured at the centre of that length. Tube ends shall be cut square with the axis of the tube and shall be free from accessible burrs.

7 INSPECTION

7.1 The purchaser or his representative shall have access at all reasonable times to those parts of the manufacturer's work engaged in the production and testing of the tubes that he has ordered.

8 MECHANICAL TESTS

8.1 Tensile Test

Tensile test shall be carried out in accordance with IS 1894 : 1972 on one of the following at manufacturer's option:

a) A length cut from the end of the selected tube (the ends being plugged for grips or flattened where necessary); and

b) A longitudinal strip cut from the tube and tested in the curved condition. The test piece shall not include the weld.

The tensile strength, the yield strength and the elongation shall be determined and the values shall be not less than those specified under the appropriate grade of the material.

8.2 Drift Expansion Test

The test shall be carried out in accordance with IS 2335 : 1985. Pieces of suitable length cut from the tubes shall show no crack after being drifted to an included angle of 30° or 60°, until the outside diameter is increased by not less than the amount specified for an appropriate grade of material (*see* Tables 2 and 9).

8.3 Flattening Test

Flattening test shall be made on lengths cut from the end of selected tubes in accordance with IS 2328 : 1985. The tubes shall show no crack after being flattened until the interior surfaces are at the middle, brought to such a position that the distance apart is not more than that specified for an appropriate grade of material (*see* Tables 3 and 9).

In the case of electric resistance welded tubes, the tests shall be conducted on the tube with weld on top and weld on side. The burrs may be removed before testing.

8.3.1 Superficial surface ruptures, fissures noticed after flattening test shall be cause for rejection.

Table 2 Drift Expansion Test
(*Clause* 8.2)

Tube Designation	As Welded Percent, *Min*	Subsequently Annealed or Normalized Percent, *Min*
ERW C1	12	20
ERW C2	10	15
ERW C3	8	10

9 DIMENSIONS AND TOLERANCES

9.1 The tubes covered in this standard have an outside diameter in the range of 6·35 to 44·5 mm and thickness in the range of 0·7 to 3·25 mm. The sizes other than those specified may be supplied as agreed to between the purchaser and the manufacturer.

9.2 Tolerances on dimensions shall be as specified in the relevant parts of this standard.

Table 3 Flattening Test
(*Clause* 8.3)

Tube Designation	As Welded	Subsequently Annealed or Normalized
ERW C1	$3t$*	$1t$*
ERW C2	$5t$*	$2t$*
ERW C3	$8t$*	$3t$*

*t = specified thickness.

10 SELECTION OF TUBES FOR TESTING

10.1 Where the purchaser requires tests specially related to his order, the tests shall be carried out at the rate of one set of tests per batch of up to and including 1 500 m of one size of tube ordered, with an additional test for each additional 1 500 m or part thereof.

When the purchaser requires additional tests related in his order, such tests shall be the subject of agreement between the purchaser and the manufacturer.

11 TEST CERTIFICATE AND MARKING

11.1 The manufacturer shall carry out the specified tests applicable to each type of tube, and he shall supply a certificate stating that the tubes comply with the specified requirements. When the purchaser desires such certificates, this shall be stated in the enquiry and order.

11.2 Unless otherwise agreed to between the purchaser and the manufacturer, each bundle or crate or package of steel tubes shall be suitably marked with the following:

a) Outside diameter, thickness and length;

b) The number of this Indian Standard;

c) Method of manufacture (ERW or CEW); and

d) Designation of the tube.

11.2.1 Each bundle or crate or package may also be marked with the Standard Mark, details for which may be obtained from the Bureau of Indian Standards.

12 PROTECTION

12.1 Unless otherwise specified, the tubes shall be supplied with the manufacturer's mill protective coating. Special protection of the tubes for transit and storage shall be by agreement between the purchaser and the manufacturer.

Indian Standard

STEEL TUBES FOR BICYCLE AND CYCLE RICKSHAWS — SPECIFICATION

PART 2 SPECIFIC REQUIREMENTS, ELECTRIC RESISTANCE WELDED AND INDUCTION WELDED STEEL TUBES (ERW)

(Second Revision)

1 SCOPE

1.1 This standard (Part 2) covers the specific requirements for electric resistance welded and induction welded steel tubes (ERW) designated as ERW C1, ERW C2 and ERW C3.

2 REQUIREMENTS

2.1 The general requirements shall conform to those as given in Part 1 of this standard.

3 MECHANICAL TESTS

3.1 The mechanical tests shall be carried out as given in **8** of Part 1.

3.1.1 The number of mechanical tests shall be in accordance with **10** of Part 1.

3.2 Mechanical Properties

The mechanical properties of test pieces selected and prepared in accordance with the requirements specified in Part 1, shall be as specified in Table 4.

3.2.1 *Tensile Properties*

The tensile properties shall be as specified in Table 4.

3.2.2 *Drift Expansion Test*

The percentage increase in outside diameter shall not be less than the values specified in Table 2.

3.2.3 *Flattening Test*

The distance between internal surfaces shall not be greater than those specified in Table 3.

4 DIMENSIONS AND TOLERANCES

4.1 The dimensions of tubes shall be in conformity with those given in **9** of Part 1.

4.2 Tolerances

4.2.1 *Outside Diameter*

The tolerances on outside diameter including ovality shall be as given in Table 5.

Table 4 Mechanical Properties

(*Clauses* 3.2 *and* 3.2.1)

Tube Designation	As Welded			Annealed or Normalized		
	YS MPa, *Min*	UTS MPa, *Min*	Elongation Percent, *Min*	YS MPa, *Min*	UTS MPa, *Min*	Elongation Percent, *Min*
ERW C1	200	300	10	170	270	27
ERW C2	300	400	8	220	360	25
ERW C3	350	430	8	260	380	23

1 MPa = 1 N/mm^2 = 0·102 0 kgf/mm^2.

Table 5 Tolerance on Outside Diameter (ERW) Tube

(*Clause* 4.2.1)

Outside Diameter		As Welded $D/t \leqslant 40$ and Annealed/Normalized $D/t \leqslant 20$	Annealed/Normalized Condition $20 < D/t \leqslant 40$	All Condition $D/t > 40$
Over	Up to and Including			
mm	mm	mm	mm	
—	30	+ 0·03 — 0·13	+ 0·06 — 0·15	+ 0·08 — 0·18
30	44·5	+ 0·06 — 0·14	+ 0·07 — 0·16	+ 0·1 — 0·2

NOTE — Due to the release of internal stress when as welded tube is cut, a change in dimensions is usual. Hence this tolerance does not include ovality within 100 mm of tube end which is in the as welded condition and which has a diameter to thickness ratio greater than 20 : 1.

4.2.2 *Tolerances on Thickness*

The tolerances on thickness including eccentricity but excluding the weld shall be ±8 percent of the specified thickness.

4.2.3 *Tolerances on Length*

The tubes shall be supplied in mill lengths of 4 to 7 m subject to a tolerance of −0 +100 mm.

The tolerance on specified cut lengths shall be as given in Table 6.

In case of cut tubes at the end up to 100 mm the mean outside diameter $\left(\frac{Max\ OD + Min\ OD}{2}\right)$ shall be within these tolerances.

Table 6 Tolerance on Specified Cut Lengths

(*Clause* 4.2.3)

Length		Tolerance	
Over	Up to and Including		
mm	mm	mm	mm
		(A)*	(B)
	500	−0 +1	−0 +2
500	2 000	−0 +1·5	−0 +3
2 000	5 000	−0 +3	−0 +3
5 000	7 000	−0 +5	−0 +5

*Tolerance level A or B should be agreed upon mutually.

Indian Standard

STEEL TUBES FOR BICYCLE AND CYCLE RICKSHAWS — SPECIFICATION

PART 3 SPECIFIC REQUIREMENTS, COLD FINISHED RESISTANCE WELDED AND INDUCTION WELDED STEEL TUBES (CEW)

(Second Revision)

1 SCOPE

1.1 This standard (Part 3) covers the specific requirements for cold finished electric resistance welded and induction welded steel tubes (CEW) designated as CEW C1, CEW C2 and CEW C3.

2 REQUIREMENTS

2.1 The general requirements shall conform to those given in Part 1 of this Indian standard.

3 CHEMICAL COMPOSITION

3.1 The chemical composition of steel shall be as given in **5** and Table 1 of Part 1.

4 NUMBER OF MECHANICAL TESTS

4.1 The mechanical tests shall be carried out as per **8** of Part 1.

4.1.1 The number of mechanical tests shall be in accordance with **10** of Part 1.

4.2 Mechanical Properties

The mechanical properties of test pieces selected and prepared in accordance with the requirements specified in Part 1 shall be as specified in Table 7.

4.2.1 *Tensile Properties*

The tensile properties shall be as specified in Table 7.

4.2.2 *Drift Expansion Test*

The percentage increased in outside dimensions shall not be less than the values specified in Table 8.

4.2.3 *Flattening Test*

The distance between outside surfaces shall not be greater than those specified in Table 9.

Table 8 Drift Expanding Test

(*Clause* 4.2.2)

Tube Designation	Annealed/Normalized Tube, *Min*, Percent
CEW C1	20
CEW C2	15
CEW C3	10

Table 9 Flattening Tests

(*Clause* 4.2.3)

Tube Designation	Annealed/Normalized Tubes, *Min*
CEW C1	t
CEW C2	$2t$
CEW C3	$3t$

t = thickness of tube.

Table 7 Mechanical Properties

(*Clauses* 4.2 *and* 4.2.1)

Tube Designation	As Drawn			Annealed or Normalized		
	YS MPa, *Min*	UTS MPa, *Min*	Crushing (% Red), *Min*	YS MPa, *Min*	UTS MPa, *Min*	Crushing (% Red), *Min*
CEW C1	320	400	25	170	270	50
CEW C2	360	450	25	220	360	50
CEW C3	400	480	—	260	380	25

1 MPa = 0·102 0 kgf/mm^2.

5 DIMENSIONS AND TOLERANCES

5.1 The dimensions of tube shall be in conformity with those given in 9 of Part 1.

5.2 Tolerances

The tolerances on outside diameter, thickness and length shall be as follows.

5.2.1 *Diameter*

The tolerance on outside diameter including ovality shall conform to Table 10.

5.2.2 *Tolerance on Mean Thickness*

No tube shall have a mean thickness that departs from the specified thickness by more than:

a) ±0·1 mm for tubes up to and including 2·0 mm thick.

b) ±0·15 mm for tubes over 2 mm thick.

At no point the tolerance on thickness including eccentricity shall exceed ±7·5 percent of thickness.

5.2.3 *Length*

The tube shall be supplied in either:

a) random length of 3 to 7 m, or

b) specified cut lengths to the tolerance given in Table 6.

Table 10 Tolerance Outside Diameter (CEW)

(*Clause* 5.2.1)

Over	Up to and Including	As Drawn $D/t \leqslant 10$ as Annealed/ Normalized $D/t \leqslant 20$ Condition	Normalized Condition $20 < D/t \leqslant 40$
	mm	mm	mm
	30	+0·03 —0·13	+0·05 —0·15
30	44·4	+0·05 —0·15	+0·08 —0·18

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Amendments Issued Since Publication

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Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 1 DECEMBER 1995
TO
IS 2039 (Parts 1 to 3) : 1991 STEEL TUBES FOR BICYCLE AND CYCLE RICKSHAWS — SPECIFICATION

(Second Revision)

(*Page* 2, *clause* **8.2**, *last line*) — Substitute the following for the existing:

'(*see* Tables 2 and 8).'

(*Page* 6, *Table* 10, *col* 2) — Substitute '44.5' *for* '44.4'.

(MTD 19)

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